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PATENT APPLICATION

TRANSMITTAL FOR U.S. PATENT APPLICATION
UNDER 37 CFR §1.53(b)

Box Patent Application
ASSISTANT COMMISSIONER
OF PATENTS
Washington, D.C. 20231
Sir:

Attorney's Docket: 066303.0109

Transmitted herewith for filing is the original patent application of:

Inventor: Ronald D. Lutz, Jr.

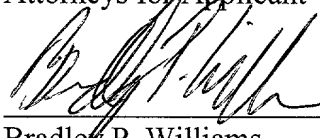
For: SYSTEM AND METHOD FOR HOUSING TELECOMMUNICATIONS
EQUIPMENT

Enclosed are: Specification, Claims and Abstract (14 Total Pages)
Two Sheets of Formal Drawings
Declaration and Power of Attorney
An Assignment of the invention to General Bandwidth Inc., and
Transmittal with recordation fee of \$40.00.

FEE CALCULATION					FEE
	Number		Number Extra	Rate	Basic Fee \$345.00
Total Claims	25	20	5	X \$ 9 =	45.00
Independent Claims	4	3	1	X \$39 =	39.00
TOTAL FILING FEE =					\$ 429.00

Enclosed is a check in the amount of \$429.00 for filing fee. Please charge any additional fees or credit any overpayment to Deposit Account No. 02-0384 of Baker Botts L.L.P. A duplicate copy of this sheet is enclosed.

BAKER BOTTS L.L.P.
Attorneys for Applicant


Bradley P. Williams
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Date: 5/26/00

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: LUTZ, Ronald D., Jr.
Date Filed: May 26, 2000
Title: SYSTEM AND METHOD FOR HOUSING
TELECOMMUNICATIONS EQUIPMENT

BOX PATENT APPLICATION

Honorable Assistant Commissioner
For Patents
Washington, D.C. 20231

Dear Sir:

CERTIFICATE OF MAILING BY EXPRESS MAIL

I hereby certify that the attached Patent Application, Declaration and Power of Attorney, Assignment, Assignment Cover Sheet, transmittal forms, formal Drawings, Information Disclosure Statement, Verified Statement Claiming Small Entity Status and checks in the amount of \$429.00 and \$40.00, are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. § 1.10 on this 26th day of May, 2000 and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Willie Jiles

Willie Jiles

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Attorney's Docket:
066303.0109

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05579640-092600

Applicant or Patentee: LUTZ, Ronald D., Jr.

Attorney's Docket No. 066303.0109

Serial or Patent No. _____

Filed or Issued: _____

Title: SYSTEM AND METHOD FOR HOUSING TELECOMMUNICATIONS EQUIPMENT

**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c)) – SMALL BUSINESS CONCERN**

I hereby state that I am an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Small Business Concern: General Bandwidth Inc.
Address of Small Business Concern: 12303-B Technology Blvd.
Austin, Texas 78727

I hereby state that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled **SYSTEM AND METHOD FOR HOUSING TELECOMMUNICATIONS EQUIPMENT** by inventor **RONALD D. LUTZ, JR.**, described in the specification filed herewith.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e):

NONE

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or my maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

Name of Person Signing: Brendon W. Mills
Title of Person if other than owner: President and CEO
Address of Person Signing: 12303-B Technology Blvd.
Austin, Texas 78727

Signature: _____

Date: _____

5-12-00

SYSTEM AND METHOD FOR HOUSING
TELECOMMUNICATIONS EQUIPMENT

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TECHNICAL FIELD OF THE INVENTION

10 This invention relates generally to the field of telecommunications and, more specifically, to a system and method for housing telecommunications equipment.

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BACKGROUND OF THE INVENTION

Chassis are frameworks used to house telecommunications equipment, and are often found in a room or other area where, for example, switching takes place. This other room or area is often referred to as a "central office environment." When stacking chassis in a central office environment, important considerations include, among others, the proper cooling of each chassis, the efficient stacking of chassis to avoid wasted space, and meeting certain environmental requirements. The installer of telecommunication equipment has to be certain that lower chassis do not preheat upper chassis or that upper chassis do not block air flow from lower chassis. This was usually solved by perforating the tops and bottoms of chassis to obtain good vertical cooling. However, new network equipment-building standards ("NEBS") by Bell Atlantic and other RBOC companies discourage the design of complete vertical cooling because fire in lower chassis can easily pass through to upper chassis. Therefore, most chassis are now designed with substantially solid tops, and chassis are stacked in a rack with gaps or vent hoods between them. Usually, the gaps between chassis are 1.75" – 3.5" (1.75" is referred to herein as one "rack unit"). And since space is at a premium when stacking and arranging telecommunication equipment, this wastes valuable space.

SUMMARY OF THE INVENTION

Since the challenges in the field of telecommunications continue to increase with demands for more and better techniques having greater flexibility and adaptability, a need has arisen for a new system and method for housing telecommunications equipment. In accordance with the present invention, a system and method for housing telecommunications equipment is provided that substantially eliminates or reduces disadvantages and problems associated with previously developed systems and methods.

A system for housing telecommunications equipment is disclosed. The system comprises a plurality of vertically disposed chassis housing the telecommunications equipment, each chassis having a top that is substantially closed, first and second ends, first and second sides, and a base, wherein the top of each chassis is adapted to receive the base of an adjacent chassis. At least one vent is formed in each chassis adjacent the base for allowing air to enter the chassis. The vent is disposed between the base and a portion of the chassis selected from the group consisting of either of the first end, the second end, the first side, and the second side, and the vent is nonplanar in relation to that portion. More specifically, the chassis may be vertically disposed with substantially zero gap, and the vent member may be either an angled vent member or a notched vent member.

A method for housing telecommunications equipment is disclosed. The method comprises two steps. Step one calls for vertically disposing a plurality of chassis, each chassis housing the telecommunications equipment and having a top that is substantially closed, first and second ends, first and second sides, and a base. The top of each chassis is adapted to receive the base of an adjacent chassis. Step two requires forming at least one vent in each chassis adjacent the base, wherein the vent is operable to allow air to enter the chassis. The vent is disposed between the base and a portion of the chassis selected from the group consisting of either of the first end, the second end, the first side, and the second side, and the vent is nonplanar in relation to that portion. More specifically, the chassis may be vertically disposed with substantially zero gap, and the vent member may be either an angled vent member or a notched vent member.

Embodiments of the invention provide numerous technical advantages. For example, a technical advantage of one embodiment is that valuable central office space can be saved by closely stacking chassis in a rack while still achieving desired cooling of the chassis. Since in one embodiment, vents in the chassis are either angled or notched, air can enter near the base of each chassis even though the chassis are closely stacked together. If only one chassis exists, this one chassis can be placed on a solid support, such as a floor or table, while still achieving the desired cooling.

Another technical advantage of an embodiment of the present invention is that the desired cooling of chassis, along with the desired close stacking of chassis, can be achieved in an manner that complies with new network equipment-building standards ("NEBS") fire-spreading criteria.

An additional technical advantage of an embodiment of the present invention is that a myriad of designs can be used for the vent depending upon what type of cooling is desired for a particular chassis arrangement.

Other technical advantages are readily apparent to one skilled in the art from the following figures, descriptions, and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the invention, and for further features and advantages, reference is now made to the following description, taken in conjunction with the accompanying drawings, in which:

FIGURE 1A is a front elevational view illustrating one system for housing telecommunications equipment useful in the practice of the present invention;

FIGURE 1B is a side elevational view illustrating one system for housing telecommunications equipment useful in the practice of the present invention;

FIGURE 2A illustrates one housing system having angled vent members and
10 resting on a support; and

FIGURE 2B illustrates another housing system having notched vent members and resting on a support.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Embodiments of the present invention and its advantages are best understood by referring now to FIGURES 1A, 1B, 2A and 2B of the drawings, in which like numerals refer to like parts.

5 FIGURES 1A and 1B are front and side elevational views illustrating a system 100 for housing telecommunications equipment 102 in accordance with one embodiment of the present invention. Telecommunications equipment 102 may be any type of telecommunications equipment stored in a chassis; however, in this example, telecommunications equipment 102 is equipment utilized in a central office
10 environment, or similar environment, such as an ATM switch or a DSLAM. In one embodiment, system 100 comprises a plurality of chassis 104 stacked in an equipment frame (not shown). In this example, telecommunications chassis 104 has a substantially solid top 106, first end 108, second end 110, first and second sides 112, and a base 114, and are made of a lightweight material such as steel, other metals such
15 as aluminum, or other materials which are fire resistant; however, other configurations and materials may be used.

As shown best in FIGURE 1B, chassis 104 comprises at least one vent 116 located adjacent base 114 for allowing air to enter chassis 104 via apertures 118 (FIGURE 1A). Chassis 104 may also have at least one intake vent 124 (FIGURE 1B)
20 located on one or both sides 112 for allowing air to enter chassis 104; however, intake vent 124 is not required. Vent 116, which is described in detail below, allows air to enter the internal portion of chassis 104 to cool telecommunications equipment 102. Heated air inside chassis 104 exits via exhaust vents 120, as can be seen in FIGURE 1B. In this embodiment, exhaust vents 120 are integral with either the sides 112, first
25 end 108, or second end 110 of chassis 104; however, exhaust vents 120 may also be integral with top 106 of chassis 104, depending upon the type and configuration of telecommunications equipment 102 in chassis 104. Additionally, exhaust vents 120 may be attached to these components in a non-integral fashion. The air that enters chassis 104 through apertures 118 in vent 116 may be natural convection ambient air
30 or may be forced air, such as air forced with a fan. Apertures 118 may be formed in any desired configuration, such as circular, hexagonal, oval or square, and in this

example provide a total area of apertures sufficient to meet the cooling requirement for a particular heat load generated by telecommunications equipment 102 in chassis 104. In this example, the total area of apertures 118 in vent 116 is greater than the total area of apertures in exhaust vents 120. Vent 116 is adjacent base 114 of chassis 104 and may be configured as angled vent members as shown in FIGURE 2A or notched vent members as shown in FIGURE 2B.

FIGURE 2A illustrates chassis 104 with angled vent members 116. Chassis 104 is shown in FIGURE 2A to be supported by a support 122, which can be any type of support such as a floor, table, or other solid surface. Vents 116 are formed in chassis 104 such that vents 116 angle upward from an intermediate portion of base 114 and couple to either first end 108, second end 110, or side 112 of chassis 104. As can be seen in FIGURE 2A, this results in a right triangle formed by angled vent member 116, the surface of support 122, and the imaginary vertical leg normal to the surface of support 122. This right triangle can be any desired configuration depending upon the type of cooling required for chassis 104. As described below, the “angling” of vent members 116 allows chassis 104 to be stacked upon one another with a gap less than 1.75 inches and down to 0.00 inches, while still obtaining the desired or required cooling. In addition, the smaller the gap, the greater the space that is saved. The angling of vent members 116 provide a further advantage in that more space is available inside chassis 104 for telecommunications equipment 102. An alternative arrangement for vent 116 of chassis 104 is to have notched vent members 116 as shown in FIGURE 2B.

FIGURE 2B illustrates chassis 104 with notched vent members 116. As in FIGURE 2A, FIGURE 2B shows chassis 104 resting on support 122. Notched vent members 116 have two or more venting surfaces arranged in any desired configuration. For example, notched vent members 116 may have two venting surfaces that form an angle of 90° as shown in FIGURE 2B, or may have two or more venting surfaces that form angles greater than, or less than, 90°. In any configuration, the total area of apertures 118 in vents 116 may be designed based on how much cooling is required for a particular heat load generated by telecommunications equipment 102 inside chassis 104. As described below, the “notching” of vent

members 116 allows chassis 104 to be stacked upon one another with a gap less than 1.75 inches and down to 0.00 inches, while still obtaining the desired or required cooling. In addition, the smaller the gap, the greater the space that is saved. The notching of vent members 116 provide a further advantage in that more space is available inside chassis 104 for telecommunications equipment 102.

As can be seen in either FIGURE 2A or FIGURE 2B, chassis 104 rests on support 122 with substantially no gap in between. Vents 116 facilitate this by allowing air to enter chassis 104 while chassis 104 rests on support 122, or rests upon another chassis 104 as shown in FIGURES 1A and 1B. This direct stacking upon either support 122 or another chassis 104 is desirable because it saves valuable space, which is at a premium in, for example, central office environments. The present invention reduces to zero, in some embodiments, the gap between chassis stacked on top of each other, such as chassis 104. In conventional systems, a gap of 1.75" to 3.5" (one to two rack units) between adjacent chassis is maintained because these gaps are the minimum required to provide the required cooling. Gaps less than 1.75" facilitate preheating of upper chassis and may result in violations of industry standards. Vents 116 are also shown in FIGURE 2A and FIGURE 2B to be located at the lower edge of either first end 108 or second end 110. However, vents 116 may also be located on one or both sides 112 of chassis 104.

In operation, a plurality of chassis 104 are stacked in an equipment frame as shown in FIGURES 1A and 1B. At least one vent 116 is formed in each chassis 104 to allow air to enter the chassis 104 to cool telecommunications equipment 102 contained in chassis 104. Chassis 104 is stacked upon one another in the rack with a gap less than 1.75 inches, and may be stacked with a substantially zero gap. As mentioned previously, the smaller the gap, the greater the space that is saved. Either natural convection ambient air or forced air enters vents 116 to cool telecommunications equipment 102 and chassis 104, and the heated air exits exhaust vents 120, which are contained in this embodiment in either sides 112, first end 108, second end 110, or top 106. Alternatively, if a single chassis 104 is used, such as shown in FIGURE 2A or 2B, then chassis 104 is normally placed upon support 122 with a substantially zero gap between base 114 and support 122. In this case, vents

116 allow air to enter chassis 104 to cool telecommunications equipment 102. Heated air exits exhaust vents 120 as described above.

Cooling of chassis in a central office environment is an important consideration. Because of new network equipment-building standards ("NEBS"), design of complete vertical cooling is discouraged because fires in lower chassis 104 can easily pass through to upper chassis 104. Therefore most chassis 104 are designed with tops 106 that are substantially solid to prevent fire spread. The present invention allows air to enter near base 114 of chassis 104 even when chassis 104 are stacked on one another or stacked or placed on support 122, as in the case of a single chassis. This embodiment of the invention therefore allows central office equipment to be designed to meet the NEBS standards while still allowing enough cooling for telecommunications equipment 102.

Although an embodiment of the invention and its advantages are described in detail, a person skilled in the art could make various alternations, additions, and omissions without departing from the spirit and scope of the present invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A system for housing telecommunications equipment, comprising:
a plurality of vertically disposed chassis housing the telecommunications equipment, each chassis having a top that is substantially closed, first and second sides, first and second ends, and a base, wherein the top of each chassis is adapted to receive the base of an adjacent chassis;
at least one vent formed in each chassis adjacent the base, wherein the vent is operable to allow air to enter the chassis; and
wherein the vent is disposed between the base and a portion of the chassis selected from the group consisting of the first side, the second side, the first end, and the second end, and wherein the vent is nonplanar in relation to the portion.
2. The system of Claim 1 wherein at least one set of adjacent chassis in the plurality of vertically disposed chassis are separated by a gap that is less than 1.75 inches.
3. The system of Claim 1 , wherein at least one set of adjacent chassis in the plurality of vertically disposed chassis are separated by a gap that is substantially zero inches.
4. The system of Claim 1 wherein the vent has a plurality of apertures.
5. The system of Claim 1 wherein the vent is an angled vent member coupled to the base and angling toward the portion.
6. The system of Claim 1 wherein the vent is a notched vent member coupled to the base and the portion.

7. A system for housing telecommunications equipment, comprising:
a chassis housing the telecommunications equipment and having a top
that is substantially closed, first and second sides, first and second ends, and a
base;

5 at least one vent formed in the chassis adjacent the base, wherein the
vent is operable to allow air to enter the chassis; and

wherein the vent is disposed between the base and a portion of the
chassis selected from the group consisting of the first side, the second side, the
first end, and the second end, and wherein the vent is nonplanar in relation to
10 the portion.

8. The system of Claim 7 further comprising a support underneath the
base of the chassis, wherein the support is operable to support the chassis.

15 9. The system of Claim 8 wherein the chassis and the support are
separated by a gap that is less than 1.75 inches exists.

10. The system of Claim 8 wherein the chassis and the support are
separated by a gap that is substantially zero inches.

20 11. The system of Claim 7 wherein the vent has a plurality of apertures.

12. The system of Claim 7 wherein the vent is an angled vent member
coupled to the base and angling toward the portion.

25 13. The system of Claim 7 wherein the vent is a notched vent member
coupled to the base and the portion.

14. A method for housing telecommunications equipment, the method comprising:

vertically disposing a plurality of chassis, each chassis housing the telecommunications equipment and having a top that is substantially closed, first and second sides, first and second ends, and a base, wherein the top of each chassis is adapted to receive the base of an adjacent chassis; and

forming at least one vent in each chassis adjacent the base, wherein the vent is operable to allow air to enter the chassis, and wherein the vent is disposed between the base and a portion of the chassis selected from the group consisting of the first side, the second side, the first end, and the second end, and wherein the vent is nonplanar in relation to the portion.

15. The method of Claim 14 wherein vertically disposing a plurality of chassis comprises separating at least one set of adjacent chassis by a gap that is less than 1.75 inches.

16. The method of Claim 14 wherein vertically disposing a plurality of chassis comprises separating at least one set of adjacent chassis by a gap that is substantially zero inches.

17. The method of Claim 14 further comprising providing the vent with a plurality of apertures.

18. The method of Claim 14 wherein the vent is an angled vent member coupled to the base and angling toward the portion.

19. The method of Claim 14 wherein the vent is a notched vent member coupled to the base and the portion.

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20. A system for housing telecommunications equipment, comprising:

a plurality of vertically disposed chassis, each chassis housing the telecommunications equipment and having a top substantially closed, first and second sides, first and second ends, and a base, wherein the top of each chassis is adapted to receive the base of an adjacent chassis;

a first vent formed in each chassis and having a lower end and an upper end, the lower end coupled to the base and the upper end coupled to the first end of the chassis such that the front vent is nonplanar in relation to the first end;

a second vent formed in each chassis and having a lower end and an upper end, the lower end coupled to the base and the upper end coupled to the second end of the chassis such that the rear vent is nonplanar in relation to the second end; and wherein the first and second vents are operable to allow air to enter the chassis.

21. The system of Claim 22 wherein at least one set of adjacent chassis in the plurality of vertically disposed chassis are separated by a gap that is less than 1.75 inches.

22. The system of Claim 22 wherein at least one set of adjacent chassis in the plurality of vertically disposed chassis are separated by a gap that is substantially zero inches.

23. The system of Claim 22 wherein the vent has a plurality of apertures.

24. The system of Claim 22 wherein the vent is an angled vent member coupled to the base and angling toward the portion.

25. The system of Claim 22 wherein the vent is a notched vent member coupled to the base and the portion.

SYSTEM AND METHOD FOR HOUSING
TELECOMMUNICATIONS EQUIPMENT

ABSTRACT OF THE DISCLOSURE

5 A system for housing telecommunications equipment includes a plurality of
vertically disposed chassis, each chassis having a top that is substantially closed, two
sides, two ends, and a base, wherein the top of each chassis is adapted to receive the
base of an adjacent chassis. At least one vent is formed in each chassis adjacent the
base for allowing air to enter the chassis, and at least one of the ends and one of the
10 sides of the chassis are formed such that air may exit the chassis. The vent is disposed
between the base and a portion of the chassis selected from the group consisting of
either of the ends and either of the sides, and the vent is nonplanar in relation to that
portion. More specifically, the chassis may be vertically disposed with substantially
zero gap, and the vent member may be either an angled vent member or a notched
15 vent member.

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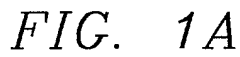


FIG. 1B

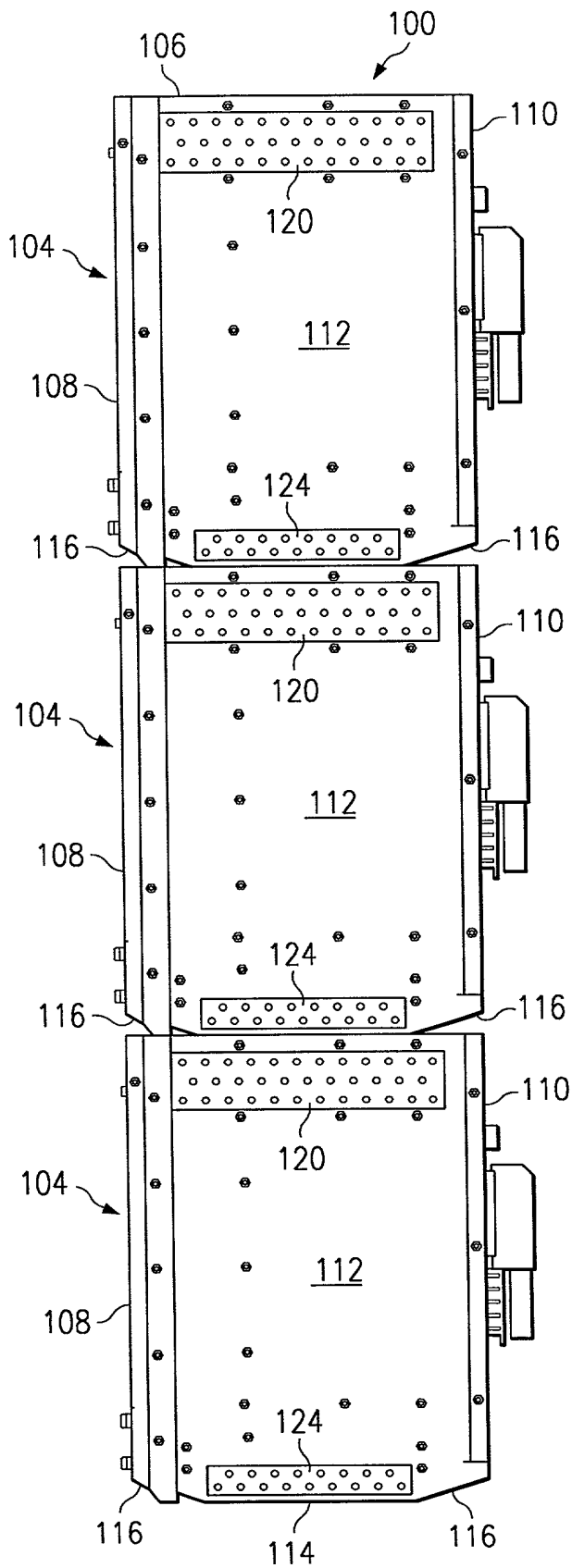


FIG. 2A

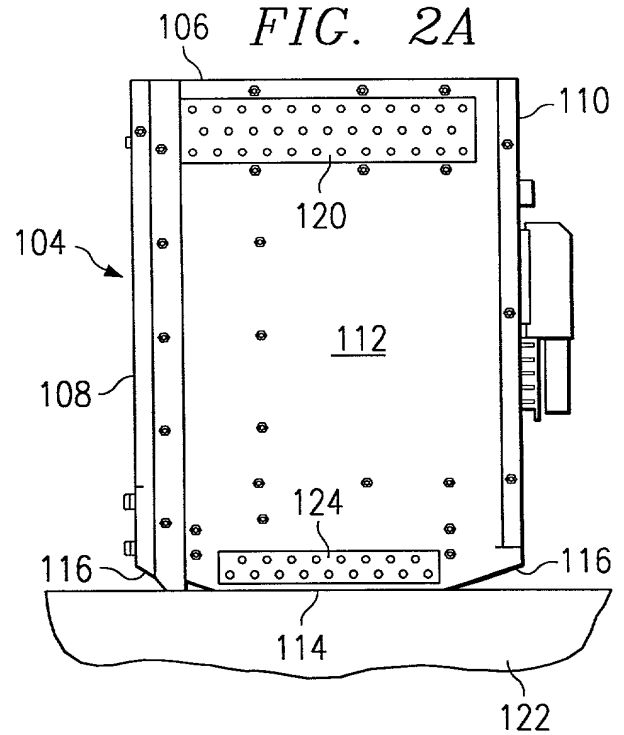
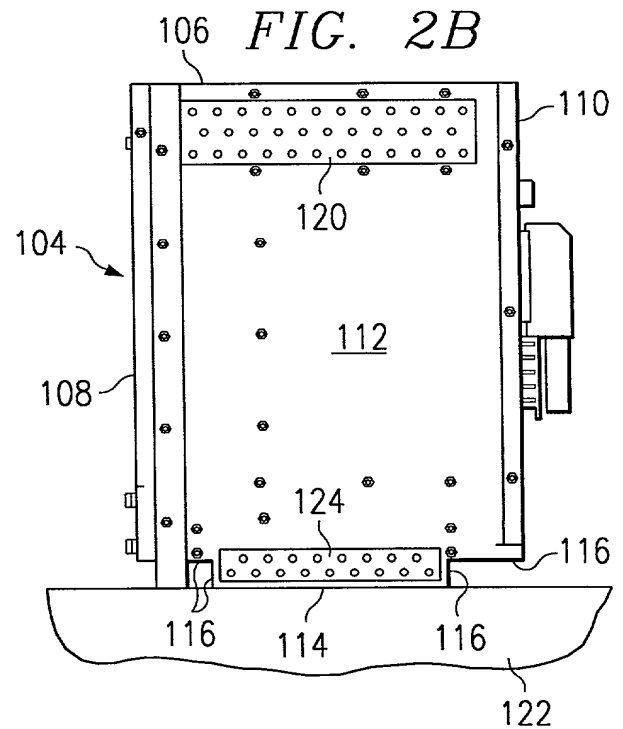


FIG. 2B



DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name, that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention or design entitled **SYSTEM AND METHOD FOR HOUSING TELECOMMUNICATIONS EQUIPMENT**, the specification of which is attached hereto;

That I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above; and that I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in 37 C.F.R. § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

<u>Number</u>	<u>Country</u>	<u>Date Filed</u>	<u>Priority Claimed (Yes) (No)</u>
-----NONE-----			

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application(s) in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in 37 C.F.R. § 1.56 which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

<u>Application Serial Number</u>	<u>Date Filed</u>	<u>Status</u>
-----NONE-----		

I hereby appoint:

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all of the firm of Baker Botts L.L.P., my attorneys/agents with full power of substitution and revocation, to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith, and to file and prosecute any international patent applications filed thereon before any international authorities.

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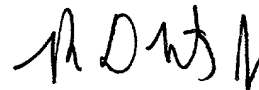
Bradley P. Williams
at Tel. 214.953.6447
Atty. Docket No. 066303.0109

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full name of the first inventor

RONALD D. LUTZ, JR.

Inventor's signature



Date

5/23/00

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